PATENT ABSTRACTS OF JAPAN

(11)Publication number : **2000-277887**

(43)Date of publication of application : **06.10.2000**

(51)Int.Cl. **H05K 3/20**

(21)Application number : **11-081540**

(22)Date of filing : **25.03.1999**

(71)Applicant : **MURATA MFG CO LTD**

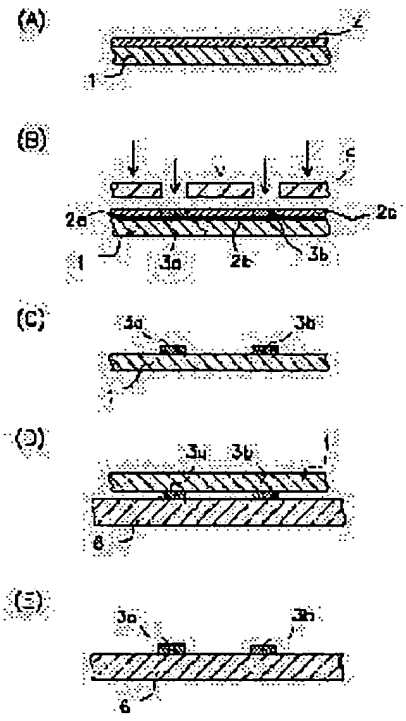
(72)Inventor : **KUBOTA MASAHIRO**
INAMI MICHIAKI
WATANABE SHIZUHARU

(54) METHOD OF FORMING CONDUCTIVE PATTERN AND MANUFACTURING CERAMIC MULTILAYER BOARD

(57)Abstract:

PROBLEM TO BE SOLVED: To form a fine conductor pattern at high accuracy by fully suppressing gelation of a coat on a support in a conductor pattern forming process by the transfer method using a photosensitive conductor paste.

SOLUTION: This conductor pattern forming method comprises the steps of coating a photosensitive conductor paste composed of an organic binder having an acid functional group, a photosensitive organic component, a polyvalent metal powder and a monool compd. having boiling point of 178°C or more on a support 1 to form a coating film 2, forming conductor patterns 3a, 3b by exposing and developing the coating film 2, and transferring the conductor patterns 3a, 3b on the support 1 to a ceramic green sheet 6.



LEGAL STATUS

[Date of request for examination] 09.08.2000

[Date of sending the examiner's decision of

rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] the photosensitivity which consists of the organic binder and the photosensitive organic component which has an acid functional group, polyvalent-metal powder, and a monochrome all compound with a boiling point of 178 degrees C or more -- a conductor -- the process which applies a paste on a base material, and the aforementioned photosensitivity -- a conductor -- the formation method of a conductor pattern characterized by to have the process which exposes and develops a paste and forms a predetermined conductor pattern, and the process which imprint on a substrate the aforementioned conductor pattern formed on the aforementioned base material
[Claim 2] The formation method of a conductor pattern characterized by providing the following. the photosensitivity which consists of the organic binder and the photosensitive organic component which have an acid functional group, polyvalent metal powder, and anion adsorptivity matter which has the property to adsorb the anion of the aforementioned organic binder -- a conductor -- the process which applies a paste on a base material the aforementioned photosensitivity -- a conductor -- the process which exposes and develops a paste and forms a predetermined conductor pattern, and the process which imprints on a substrate the aforementioned conductor pattern formed on the aforementioned base material
[Claim 3] the photosensitivity which consists of the organic binder and the photosensitive organic component which has an acid functional group, polyvalent-metal powder, and a CHIKUSO agent -- a conductor -- the process which applies a paste on a base material, and the aforementioned photosensitivity -- a conductor -- the formation method of a conductor pattern characterized by to have the process which exposes and develops a paste and forms a predetermined conductor pattern, and the process which imprint on a substrate the aforementioned conductor pattern formed on the aforementioned base material
[Claim 4] The aforementioned polyvalent metal powder is the formation method of a conductor pattern according to claim 1 to 3 characterized by being at least one sort of metal powders or the end of an alloy powder it is chosen out of the group which consists of copper, aluminum, palladium, nickel, and iron.
[Claim 5] The manufacture method of the ceramic multilayer substrate characterized by providing the following. the photosensitivity which consists of the organic binder and the photosensitive organic component which have an acid functional group, polyvalent metal powder, and a monochrome all compound with a boiling point of 178 degrees C or more -- a conductor -- the process which applies a paste on a base material the aforementioned photosensitivity -- a conductor -- the process which exposes and develops a paste and forms a predetermined conductor pattern The process which imprints the aforementioned conductor pattern formed on the aforementioned base material on a ceramic green sheet. They are a laminating and the process to calcinate about the ceramic green sheet in which the aforementioned conductor pattern was prepared.
[Claim 6] The manufacture method of the ceramic multilayer substrate characterized by providing the following. the photosensitivity which consists of the organic binder and the photosensitive organic component which have an acid functional group, polyvalent metal powder, and anion adsorptivity matter

which has the property to adsorb the anion of the aforementioned organic binder -- a conductor -- the process which applies a paste on a base material the aforementioned photosensitivity -- a conductor -- the process which exposes and develops a paste and forms a predetermined conductor pattern The process which imprints the aforementioned conductor pattern formed on the aforementioned base material on a ceramic green sheet. They are a laminating and the process to calcinate about the ceramic green sheet in which the aforementioned conductor pattern was prepared.

[Claim 7] The manufacture method of the ceramic multilayer substrate characterized by providing the following. the photosensitivity which consists of the organic binder and the photosensitive organic component which have an acid functional group, polyvalent metal powder, and a CHIKUSO agent -- a conductor -- the process which applies a paste on a base material the aforementioned photosensitivity -- a conductor -- the process which exposes and develops a paste and forms a predetermined conductor pattern The process which imprints the aforementioned conductor pattern formed on the aforementioned base material on a ceramic green sheet. They are a laminating and the process to calcinate about the ceramic green sheet in which the aforementioned conductor pattern was prepared.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention -- photosensitivity -- a conductor -- it is related with the formation method of a conductor pattern using the paste, and the manufacture method of a ceramic multilayer substrate
[0002]
[Description of the Prior Art] In recent years, it is called for strongly that the RF electronic parts used for mobile communication equipment, a satellite broadcasting receiver, a computer, etc. are small and highly efficient. Moreover, the correspondence to the densification and improvement in the speed of a signal is demanded also about the circuit pattern of RF electronic parts, and in order to attain the densification and improvement in the speed of a signal, detailed-izing and thick-film-izing of wiring, an electrode, etc. of a conductor pattern are required.
[0003] the former -- the conductor of RF electronic parts -- the conductor which mixed the organic vehicle which pattern formation becomes from polyvalent metal powder and organic binders, such as copper, or an organic solvent -- after forming a pattern on an insulating substrate using a paste and drying this subsequently, the technique of calcinating has been used As for conductor pattern formation, having been based on screen printing was common here, and about 50 micrometers of the width of face and the pitch of a conductor pattern which were formed by this method were a limitation.
[0004] On the other hand, a conductor pattern is formed on two or more base materials, and the replica method of imprinting it on a green sheet is indicated by JP,63-99596,A. According to this replica method, compared with formation of the conductor pattern to the green-sheet top by screen-stencil, bleeding and a blur can be suppressed and a detailed conductor pattern can be formed with high precision. However, by this method, since the conductor pattern to a base material top is formed by screen-stencil, as mentioned above, about 50 micrometers of the width of face and the pitch of a conductor pattern are a limitation.
[0005] moreover, the replica method mentioned above to JP,10-75039,A, JP,10-200260,A, and JP,10-209334,A -- setting -- a base material top -- photosensitivity -- a conductor -- a conductor pattern is formed by the photolithography method using the paste, and the method of imprinting this to a ceramic green sheet is proposed According to this method, after suppressing bleeding of a conductor pattern, a blur, etc., width of face and a pitch can form a very detailed conductor pattern 50 micrometers or less.
[0006]
[Problem(s) to be Solved by the Invention] In recent years, in the photolithography method, it is desired from consideration of environment for the development by water or alkali to be possible, and acid functional groups, such as a carboxyl group with the property which separates a proton for the reason, are introduced into the photosensitive organic binder.
[0007] in the replica method mentioned above, if especially conductor material is polyvalent metal powder, such as copper, when such a photosensitive organic binder is used, the anion of an organic binder and the ion of polyvalent metal which are generated after proton isolation will react, and the 3-dimensional network by ion bridge formation will form -- having -- as a result, photosensitivity -- a conductor -- it may result in gelling of a paste
[0008] photosensitivity -- a conductor -- if a paste gels, since paste viscosity will become high -- a base material top -- photosensitivity -- a conductor -- it becomes difficult to apply a paste Moreover, though it is able to apply before gelling advances, the imprint nature to about [that the unexposed section stops eluting in a developer] and a ceramic green sheet will also fall at the time of exposure and a development.
[0009] on the other hand, the compound which has the Lynn content compounds, such as a phosphoric acid, in JP,9-218509,A, and has azole structures, such as a benzotriazol, in JP,9-218508,A and JP,10-209334,A -- respectively -- photosensitivity -- a conductor -- it is supposed that the gelling can be prevented by making a paste contain however -- actual -- these methods -- photosensitivity -- a conductor -- in the replica method which did not pass over time until a paste gels to lengthen a little, but mentioned it above especially, formation of a detailed conductor pattern was substantially difficult
[0010] Moreover, the technique of adding 3-methyl-3-methoxybutanol during a paste is indicated by JP,10-171107,A as the technique of preventing gelling of a photosensitive paste good. However, when, as for 3-methyl-3-methoxybutanol, the boiling point dries the paint film formed on the base material for a 174-degree-C and low reason, 3-methyl-3-methoxybutanol may evaporate completely from a paint film, and the use of gelling prevention may fall greatly. Gelling of the paint film after dryness may also reduce the imprint nature to about [that the unexposed section stops eluting in a developer] and a ceramic green sheet at the time of the exposure, as mentioned above.
[0011] what solves the trouble which mentioned this invention above -- it is -- the purpose -- photosensitivity -- a conductor -- it

is in offering the formation method of a conductor pattern which fully suppresses gelling of a paste, and gelling of the paint film after dryness, and forms a detailed conductor pattern with high precision
[0012] The purpose of further others of this invention is to form a detailed conductor pattern with high precision on a ceramic green sheet, and fully manufacture the ceramic multilayer substrate corresponding to high-speed-signal-izing and the formation of high-density wiring.
[0013]
[Means for Solving the Problem] namely, the photosensitivity which this invention becomes from the organic binder and the photosensitive organic component which have an acid functional group, polyvalent metal powder, and a monochrome all compound with a boiling point of 178 degrees C or more -- a conductor -- with the process which applies a paste on a base material the aforementioned photosensitivity -- a conductor -- the formation method (the pattern formation method is called. the 1st conductor of the following and this invention --) of the conductor pattern characterized by having the process which exposes and develops a paste and forms a predetermined conductor pattern, and the process which imprints on a substrate the aforementioned conductor pattern formed on the aforementioned base material It starts.
[0014] Moreover, the organic binder with which this invention has an acid functional group, a photosensitive organic component, the photosensitivity which consists of polyvalent metal powder and anion adsorptivity matter which has the property to adsorb the anion of the aforementioned organic binder -- a conductor -- with the process which applies a paste on a base material the aforementioned photosensitivity -- a conductor -- the formation method (the pattern formation method is called. the 2nd conductor of the following and this invention --) of the conductor pattern characterized by having the process which exposes and develops a paste and forms a predetermined conductor pattern, and the process which imprints on a substrate the aforementioned conductor pattern formed on the aforementioned base material It starts.
[0015] moreover, the photosensitivity which this invention becomes from the organic binder and the photosensitive organic component which have an acid functional group, polyvalent metal powder, and a CHIKUSO agent -- a conductor -- with the process which applies a paste on a base material the aforementioned photosensitivity -- a conductor -- the formation method (the pattern formation method is called. the 3rd conductor of the following and this invention --) of the conductor pattern characterized by having the process which exposes and develops a paste and forms a predetermined conductor pattern, and the process which imprints on a substrate the aforementioned conductor pattern formed on the aforementioned base material It starts.
[0016] furthermore, the photosensitivity which this invention becomes from the organic binder and the photosensitive organic component which have an acid functional group, polyvalent metal powder, and a monochrome all compound with a boiling point of 178 degrees C or more -- a conductor -- with the process which applies a paste on a base material the aforementioned photosensitivity -- a conductor -- with the process which exposes and develops a paste and forms a predetermined conductor pattern The process which imprints the aforementioned conductor pattern formed on the aforementioned base material on a ceramic green sheet, The manufacture method of the ceramic multilayer substrate characterized by having a laminating and the process to calcinate for the ceramic green sheet in which the aforementioned conductor pattern was prepared (the manufacture method of the 1st ceramic multilayer substrate of this invention is called hereafter.) It provides.
[0017] Moreover, the organic binder with which this invention has an acid functional group, a photosensitive organic component, the photosensitivity which consists of polyvalent metal powder and anion adsorptivity matter which has the property to adsorb the anion of the aforementioned organic binder -- a conductor -- with the process which applies a paste on a base material the aforementioned photosensitivity -- a conductor -- with the process which exposes and develops a paste and forms a predetermined conductor pattern The process which imprints the aforementioned conductor pattern formed on the aforementioned base material on a ceramic green sheet, The manufacture method of the ceramic multilayer substrate characterized by having a laminating and the process to calcinate for the ceramic green sheet in which the aforementioned conductor pattern was prepared (the manufacture method of the 2nd ceramic multilayer substrate of this invention is called hereafter.) It provides.
[0018] moreover, the photosensitivity which this invention becomes from the organic binder and the photosensitive organic component which have an acid functional group, polyvalent metal powder, and a CHIKUSO agent -- a conductor -- with the process which applies a paste on a base material the aforementioned photosensitivity -- a conductor -- with the process which exposes and develops a paste and forms a predetermined conductor pattern The process which imprints the aforementioned conductor pattern formed on the aforementioned base material on a ceramic green sheet, The manufacture method of the ceramic multilayer substrate characterized by having a laminating and the process to calcinate for the ceramic green sheet in which the aforementioned conductor pattern was prepared (the manufacture method of the 3rd ceramic multilayer substrate of this invention is called hereafter.) It ******.
[0019] the 1st conductor of this invention -- according to the pattern formation method -- photosensitivity -- a conductor -- since the monochrome all compound with a boiling point of 178 degrees C or more is contained during a paste -- photosensitivity -- a conductor -- gelling of a paste and gelling of the paint film after dryness can fully be suppressed, and a detailed conductor pattern can be formed with high precision
[0020] moreover -- according to the manufacture method of the 1st ceramic multilayer substrate of this invention -- photosensitivity -- a conductor -- since the monochrome all compound with a boiling point of 178 degrees C or more is contained during the paste -- photosensitivity -- a conductor -- gelling of a paste and gelling of the paint film after dryness can fully be suppressed, and a detailed conductor pattern can be formed with high degree of accuracy on a ceramic green sheet, as a result the ceramic multilayer substrate corresponding to high-speed-signal-izing and the formation of high-density wiring is fully obtained
[0021] This of the hydroxyl in a monochrome all compound is conspicuous [with polyvalent metal ion], and strong compared with the acid functional group (especially carboxyl group) of an organic binder, therefore depends it on a monochrome all

compound and polyvalent metal ion reacting previously, and barring ion bridge formation with an organic binder and polyvalent metal ion, and formation of the 3-dimensional network. Moreover, since a monochrome all compound has only one hydroxyl Even if a monochrome all compound and polyvalent metal ion join together, the 3-dimensional network by ion bridge formation is not formed. furthermore -- since the boiling point is 178 degrees C or more -- photosensitivity -- a conductor -- after the application of a paste, after performing dryness processing, the development which remained intentionally, fully demonstrated the gelling prevention ability, and was stabilized in the constituent after a monochrome all compound drying can be carried out

[0022] moreover, the 2nd conductor of this invention -- according to the pattern formation method -- photosensitivity -- a conductor -- since anion adsorptivity matter, such as hydroxyapatite, is contained during a paste -- photosensitivity -- a conductor -- gelling of a paste and gelling of the paint film after dryness can fully be suppressed, and a detailed conductor pattern can be formed with high precision

[0023] moreover -- according to the manufacture method of the 2nd ceramic multilayer substrate of this invention -- photosensitivity -- a conductor -- since the anion adsorptivity matter is contained in the paste -- photosensitivity -- a conductor -- gelling of a paste and gelling of the paint film after dryness can fully be suppressed, and a detailed conductor pattern can be formed with high degree of accuracy on a ceramic green sheet, as a result the ceramic multilayer substrate corresponding to high-speed-signal-izing and the formation of high-density wiring is fully obtained

[0024] If the organic binder which has acid functional groups, such as a carboxyl group with the anion adsorptivity matter which has the property to adsorb an anion, and the property which separates a proton, is mixed, this The aforementioned anion adsorptivity matter adsorbs the anion of the organic binder generated after proton isolation, and a microstructure like micro phase separation is formed in mixture. by it If it sees on a macro target, although the aforementioned mixture is uniform, if it sees in micro, it will become uneven, and it is based on a bird clapper that the 3-dimensional network by ion bridge formation cannot be made easily.

[0025] moreover, the 3rd conductor of this invention -- according to the pattern formation method -- photosensitivity -- a conductor -- since the CHIKUSO agent (thixotropy regulator) is contained during a paste -- photosensitivity -- a conductor -- gelling of a paste and gelling of the paint film after dryness can fully be suppressed, and a detailed conductor pattern can be formed with high precision

[0026] moreover -- according to the manufacture method of the 3rd ceramic multilayer substrate of this invention -- photosensitivity -- a conductor -- since the CHIKUSO agent is contained in the paste -- photosensitivity -- a conductor -- gelling of a paste and gelling of the paint film after dryness can fully be suppressed, and a detailed conductor pattern can be formed with high degree of accuracy on a ceramic green sheet, as a result the ceramic multilayer substrate corresponding to high-speed-signal-izing and the formation of high-density wiring is fully obtained

[0027] the photosensitivity in which this contains a photosensitive organic binder -- a conductor -- if a CHIKUSO agent is mixed during a paste, a CHIKUSO agent will be involved in the macromolecule chain of an organic binder, and will be because the so-called network structure is formed namely, photosensitivity -- a conductor -- a paste and gelling of the paint film advance according to the ionic bond of the anion of an organic binder, and polyvalent metal ion However, in order to carry out ionic bond, when distance must be close to the grade which a mutual Coulomb force commits and the aforementioned network structure is formed of mixture of a CHIKUSO agent, the energy for breaking the aforementioned network structure is needed for ionic bond. Therefore, it is thought that it is hard coming to generate the 3-dimensional network of the ion bridge formation by polyvalent metal, and gelling can be suppressed.

[0028]

[Embodiments of the Invention] First, the 1st conductor pattern formation method of this invention and the manufacture method of the 1st ceramic multilayer substrate are explained.

[0029] In the 1st conductor pattern formation method of this invention, and the manufacture method of the 1st ceramic multilayer substrate the boiling point as the aforementioned monochrome all compound 178 degrees C or more 1-octyl alcohol, 2-octyl alcohol, nonyl alcohol, Decyl alcohol, 1-methyl cyclohexanol, a trimethyl cyclohexanol, Ethylene glycol monochrome acetate, the diethylene-glycol monobutyl ether, A diethylene glycol monoethyl ether, the diethylene-glycol monochrome hexyl ether, The diethylene-glycol monomethyl ether, the diethylene-glycol monomethyl ether, Diethylene-glycol monochrome vinyl ether, the dipropylene-glycol monomethyl ether, The dipropylene-glycol monoethyl ether, the dipropylene-glycol monobutyl ether, The ethylene glycol isoamyl ether, an ethylene glycol phenyl ether, An ethylene glycol benzyl ether, a trimethyl hexanol, a tetrahydrofurfuryl alcohol, Cresol, a butyl lactate, benzyl alcohol, hydroxyethyl acrylate, Phenethyl alcohol, a mercapto butanol, hydroxyethyl methacrylate, Hydroxyethyl piperazine, a cyclohexanone oxime, hydroxy methoxy allyl-compound benzene, A hydroxy methoxy benzaldehyde, a hydroxymethyl piperazine, A hydroxy propionitrile, hydroxy aceto NAFUTON, a hydroxy benzaldehyde, A hydroxy acetophenone, a hydroxy benzimidazole, a phenylphenol, A hydroxybenzoic acid, a hydroxy benzophenone, a benzoin, Timor, A hydroxy methoxy benzoic acid, a hydroxymethyl benzoic acid, a hydroxymethyl pyrone, A hydroxy naphthoic acid, a hydroxy naphthoquinone, hydroxy norbornene dicarboxyimide, A hydroxyphenyl acetic acid, hydroxy phenylglycine, a hydroxy phthalimide, A hydroxy pivalate neopentyl glycol ester, hydroxy propiophenone, hydroxy stearin acid, a hydroxy amber acid imide, a hydroxy toluic acid, pentaerythritol diacrylate monostearate, or its mixture is mentioned.

[0030] moreover, the content of the aforementioned monochrome all compound -- photosensitivity -- a conductor -- it is desirable that it is more than a double-precision mol to the number of mols of the ion of the aforementioned polyvalent metal eluted into the solution portion under paste It becomes difficult to fully prevent gelling as the content is under a double-precision mol. in addition, the number of mols of the eluted polyvalent metal ion -- a centrifuge method, a filtration process, etc. -- the aforementioned photosensitivity -- a conductor -- after separating the solid-state portion and solution portion under paste, it can

measure by methods, such as a well-known atomic absorption method, ICP, and ICP-MS
[0031] moreover, the aforementioned photosensitivity -- a conductor -- when the organic solvent is included during a paste, as for the rate for which the aforementioned monochrome all compound accounts, it is desirable that it is 10 - 92 % of the weight in the total quantity of the aforementioned monochrome all compound and the aforementioned organic solvent Sufficient suppression of gelling is difficult in the rate being 10 or less % of the weight. moreover -- if the rate is 92 % of the weight or more -- photosensitivity -- a conductor -- the viscosity of a paste may fall extremely and the application nature of a paste may deteriorate however, the aforementioned monochrome all compound -- photosensitivity -- a conductor -- it is also possible to use it as an organic solvent of a paste
[0032] Next, the 2nd conductor pattern formation method of this invention and the manufacture method of the 2nd ceramic multilayer substrate are explained.
[0033] As for the aforementioned anion adsorptivity matter, in the 2nd conductor pattern formation method of this invention, and the manufacture method of the 2nd ceramic multilayer substrate, it is desirable that it is the particle of 0.01-50 micrometers of mean particle diameters. The anion adsorptivity matter adsorbs the anion of an organic binder efficiently as it is the particle which has such a particle size.
[0034] Moreover, the aforementioned anion adsorptivity matter may take the form of a non-subtlety particle or an organic particle. As the aforementioned inorganic particle, hydroxyapatite, a hydrotalcite, a phosphoric-acid zirconium, a water antimony oxide, etc. are suitable. An anion convertibility resin etc. can be used as the aforementioned organic particle. Moreover, for example, ** divinylbenzene, The thing and ** trivinylbenzene which introduced the 1st class, the 2nd class, the 3rd class, or the 4th class amino group into the parent for the copolymer with acrylate, methacrylate, or acrylonitrile as ion exchange groups, The thing and ** trimethylol-propane TORIMETA krill acid ester which introduced the 1st class, the 2nd class, the 3rd class, or the 4th class amino group into the parent for the copolymer with acrylate, methacrylate, or acrylonitrile as ion exchange groups, The thing and ** ethylene glycol dimethacrylate ester which introduced the 1st class, the 2nd class, the 3rd class, or the 4th class amino group into the parent for the copolymer with acrylate, methacrylate, or acrylonitrile as ion exchange groups, What introduced the 1st class, the 2nd class, the 3rd class, or the 4th class amino group into the parent as an ion exchange group is mentioned in a copolymer with acrylate, methacrylate, or acrylonitrile.
[0035] Next, the 3rd conductor pattern formation method of this invention and the manufacture method of the 3rd ceramic multilayer substrate are explained.
[0036] the 3rd conductor of this invention -- the pattern formation method and the manufacture method of the 3rd ceramic multilayer substrate -- setting -- the content of the aforementioned CHIKUSO agent -- photosensitivity -- a conductor -- as compared with the paste whole quantity, 0.001 - 30 % of the weight and further 0.1 - 10 % of the weight are desirable At less than 0.001 % of the weight, if it is difficult to fully suppress gelling and it exceeds another side and 30 % of the weight, the viscosity of a paste will be too high and use will become difficult.
[0037] Moreover, as the aforementioned CHIKUSO agent, what is generally called "thickening, sagging ** and the sedimentation inhibitor", the "sagging ** and a sedimentation inhibitor", and "pigment humidity and distribution / sedimentation inhibitor" can be used, and the mixture of a vegetable polymerized-oil system, a polyether ester type surfactant, a hydrogenation castor oil system, a hydrogenation castor oil system, and an AMAIDO system, a fatty-acid AMAIDO wax system, etc. are mentioned as "thickening, sagging **, and a sedimentation inhibitor." As "sagging ** and a sedimentation inhibitor", moreover, a special fatty-acid system, a sulfate type and an anion system surfactant, The mixture of an oxidization polyethylene system, an oxidization polyethylene system, and an AMAIDO system etc. can be used. as a "pigment humidity and distribution / sedimentation inhibitor" The amine salt of a fatty-acid system multiple-valued carboxylic acid and macromolecule polyester, a polyether ester type anion system surfactant, The AMAIDO amine salt of the salt of the long-chain amine salt of the amount polycarboxylic acid of macromolecules, long-chain poly friend NOR MAIDO, the salt of macromolecule acid polyester and long-chain poly friend NOR MAIDO, and a phosphoric acid, a special denaturation poly AMAIDO system, a phosphoric ester system surfactant, and a macromolecule polyester acid can be used.
[0038] In this invention next, the aforementioned photosensitive organic component The monomer and oligomer which can use a well-known photopolymerization nature compound or an optical denaturation compound, for example, have reactant functional groups, such as (1) unsaturation machine The so-called diazo resins, such as a condensation product of mixture with optical radical generating agents, such as an aromatic carbonyl compound, (2) aromatic screw azide, and formaldehyde, (3) The mixture of addition polymerization nature compounds, such as an epoxy compound, and photo-oxide generating agents, such as a diaryl iodonium salt, (4) naphthoquinonediazide system compound, etc. are mentioned. Among these, especially a desirable thing is the mixture containing reactant functional groups, such as an unsaturation machine, of optical radical generating agents, such as a monomer, and oligomer, an aromatic carbonyl compound.
[0039] As monomer oligomer containing this reactant functional group A hexandiol thoria chestnut rate, a tripropylene glycol thoria chestnut rate, Trimethylolpropane triacrylate, stearylacrylate, Tetrahydrofurfuryl acrylate, laurylacrylate, 2-phenoxy ethyl acrylate, Isodecyl acrylate, iso octyl acrylate, tridecyl acrylate, Caprolactone acrylate, ethoxylation nonyl-phenol acrylate, 1, 3-butanediol diacrylate, 1, 4-butanediol diacrylate, 1, 9-nonane diol diacrylate, diethylene glycol diacrylate, Tetraethylene glycol diacrylate, triethylene glycol diacrylate, Ethoxylation bisphenol A diacrylate, propoxy-ized neopentyl glycol diacrylate, A tris (2-hydroxyethyl) isocyanurate thoria chestnut rate, Ethoxylation trimethylolpropane triacrylate, a pentaerythritol thoria chestnut rate, Propoxy-ized trimethylolpropane triacrylate, a propoxy-ized glyceryl thoria chestnut rate, Pentaerythritol tetraacrylate, ditrimethylolpropanetetraacrylate, Dipentaerythritol hydroxy pentaacrylate, ethoxylation pentaerythritol tetraacrylate, Tetrahydrofurfuryl methacrylate, cyclohexyl methacrylate, Isodecyl methacrylate, lauryl methacrylate, triethylene-glycol

dimethacrylate, Ethylene glycol dimethacrylate, tetraethylene-glycol dimethacrylate, 1, 4-butanediol dimethacrylate, diethylene-glycol dimethacrylate, 1, 6-hexanedioldimethacrylate, neopentyl glycol dimethacrylate, 1, 3-butylene-glycol dimethacrylate, ethoxylation bisphenol A dimethacrylate, Trimethylolpropanetrimethacrylate, isocyanuric-acid EO denaturation diacrylate, Ethoxylation PARAKU mill phenol acrylate, ethylhexyl carbitol acrylate, An N-vinyl-2-pyrrolidone, isobornyl acrylate, polypropylene-glycol diacrylate, polyethylene-glycol diacrylate, dipentaerythritol pentaacrylate, JIPENTAECHISURI toll hexa acrylate, etc. are mentioned.

[0040] As the aforementioned optical radical generating agent, moreover, a benzyl, benzoin ethyl ether, Benzoin isobutyl ether, benzoin iso-propyl ether, A benzophenone, a benzoylbenzoic acid, a benzoylbenzoic-acid methyl, 4-benzoyl-4'-methyl diphenyl sulfide, a benzyl dimethyl ketal, 2-n-butoxy-4-dimethylamino benzoate, 2-chloro thioxan ton, 2, 4-diethyl thioxan ton, 2, 4-diisopropyl thioxan ton, An isopropyl thioxan ton, 2-dimethylaminoethyl benzoate, p-dimethylamino ethyl benzoate, p-dimethylamino isoamyl benzoate, 3 and 3'-dimethyl-4-methoxybenzophenone, 2, 4-dimethyl thioxan ton, 1-(4-dodecyl phenyl)-2-hydroxy-isobutane-1-ON, 2 and 2-dimethoxy -1, 2-bibenzyl-1-ON, a hydroxy cyclohexyl phenyl ketone, 2-hydroxy - 2-methyl-1-phenyl propane-1-ON, 1-[4-(2-hydroxy ethoxy)-phenyl]-2-hydroxy-2-methyl-1-propane-1-ON, 2-methyl-1-[4-(methylthio) phenyl]-2-morpholinopropane-1-ON, A methyl benzoyl fall mate, the 1-phenyl -1, a 2-propane dione-2-(o-ethoxycarbonyl) oxime, A 2-benzyl-2-dimethylamino-1-(4-morpholino phenyl)-1-butanone, Screw (2, 6-dimethoxybenzoyl) - 2, 4, and 4-trimethyl pentyl phosphine oxide, screw (2, 4, 6-trimethyl benzoyl) phenyl phosphine oxide, etc. are mentioned.

[0041] Moreover, in this invention, the aforementioned organic binder which has acid functional groups, such as a carboxyl group, may be an acrylic copolymer which has a carboxyl group in a side chain. Moreover, the aforementioned polyvalent metal powder may be at least one sort chosen from the group which consists of copper, aluminum, palladium, nickel, and iron. In addition, polyvalent metal is a metal which has two or more valences.

[0042] general -- a conductor -- as a conductor material for a paste, Cu, aluminum, Pd, nickel, Fe, Pt, Au, Ag, Mo, W, these alloys, etc. are mentioned especially -- photosensitivity -- a conductor -- the polyvalent metal powder of Cu, aluminum, Pd, nickel, and Fe, or its alloy among the conductive metal powders used for a paste Although it reacts with the organic binder which has acid functional groups, such as a carboxyl group with the property which the ion is eluted in a paste and its paint film, and separates a proton, and being gelled If the measures against gelling are taken according to this invention, gelling can be suppressed effectively and the application nature to a base material top, the solubility at the time of a development, the imprint nature to a green sheet, etc. will become good.

[0043] That is, the aforementioned organic binder is the acrylic copolymer which has a carboxyl group in a side chain, and the gelling can be intentionally suppressed by especially the 3-dimensional network's according that conductive metal powders are polyvalent metal powder's, such as copper's, aluminum's, palladium's, nickel's, and iron's, to ion bridge formation being easy to be formed, therefore adding the aforementioned monochrome all compound, the aforementioned anion adsorptivity matter, or the aforementioned CHIKUSO agent in such a system.

[0044] In addition, the aforementioned acrylic copolymer can be manufactured by carrying out copolymerization of a unsaturated carboxylic acid and the ethylene nature unsaturated compound. As a unsaturated carboxylic acid in that case, an acrylic acid, a methacrylic acid, a maleic acid, a fumaric acid, vinyl acetic acids, these anhydrides, etc. are mentioned. On the other hand, as an ethylene nature unsaturated compound, fumaric-acid ester, such as methacrylic esters, such as acrylic esters, such as a methyl acrylate and an ethyl acrylate, a methyl methacrylate, and an ethyl methacrylate, and fumaric-acid monoethyl, etc. is mentioned. Moreover, what introduced the unsaturated bond of the following gestalten may be used for the aforementioned acrylic copolymer.

[0045] (1) What this and the reaction were possible to the carboxyl group of the side chain of the aforementioned acrylic copolymer, for example, added the acrylic monomer which has functional groups, such as an epoxy group, to it.

[0046] (2) What introduced saturation or the unsaturation multiple-valued carboxylic-acid anhydride further after making an unsaturation monocarboxylic acid react to the aforementioned acrylic copolymer into which it comes to introduce an epoxy group instead of the carboxyl group of a side chain.

[0047] moreover, the aforementioned photosensitivity -- a conductor -- in a paste, preservation stabilizers, such as a polymerization inhibitor, an antioxidant, a color, a pigment, a defoaming agent, and a surfactant can also be added suitably if needed Moreover, the aforementioned organic solvent can use the well-known organic solvent.

[0048] Next, drawing 1 is concretely explained to reference for the example of the conductor pattern formation method by this invention.

[0049] first, it is shown in drawing 1 (A) -- as -- a spin coater, screen-stencil, a doctor blade method, etc. -- photosensitivity -- a conductor -- a paste -- a base material 1 top -- applying -- the temperature of 10 minutes - 2 hours and 50-150 degrees C -- drying -- photosensitivity -- a conductor -- the paint film 2 by the paste is formed

[0050] Subsequently, as shown in drawing 1 (B), through the mask 5 with which the desired pattern was drawn by the paint film 2 on a base material 1, the activity beam of light from a high pressure mercury vapor lamp etc. is irradiated with the light exposure of the grade of 20 - 5000 mJ/cm2, and a paint film 2 is exposed to a predetermined pattern. Then, the portions (exposure section) 3a and 3b by which the beam of light was irradiated are hardened, and serve as a field which is not developed by the next development.

[0051] Subsequently, if general-purpose alkaline-water solutions, such as sodium-carbonate solution, are made to act on the paint film which consists of the exposure sections 3a and 3b and the unexposed sections 2a, 2b, and 2c with a spray shower etc. as shown in drawing 1 (C), the unexposed sections 2a, 2b, and 2c will begin (development) to melt into the aforementioned

alkaline-water solution, and conductor patterns 3a and 3b will be formed on a base material 1.
[0052] Subsequently, as shown in drawing 1 (D), hot printing of the conductor patterns 3a and 3b on a base material 1 is carried out to up to the ceramic green sheet 6 over the time for 5 seconds - 5 minutes using common heat press equipment under 1-200MPa and 50-150-degree C conditions.
[0053] Subsequently, as shown in drawing 1 (E), the detailed and high definition conductor patterns 3a and 3b are formed on the ceramic green sheet 6 by exfoliating a base material 1 from the ceramic green sheet 6.
[0054] namely, the conductor by this invention -- according to the pattern formation method -- photosensitivity -- a conductor -- since gelling of a paste can be suppressed and the application of a up to [the base material] can be performed smoothly, and since it fully suppresses gelling of the paint film after dryness, and it is stabilized and exposure processing and a development can be carried out, a detailed conductor pattern can be formed with high degree of accuracy on arbitrary substrates
[0055] In addition, as a base material 1 for an imprint, film-like base materials, such as polyester film, a polypropylene film, and a nylon film, can be used suitably, for example. moreover -- although mold release processing of a silicon coat, a wax coat, a melamine coat, etc. may be performed on a film-like base material in order to improve the imprint nature of a conductor pattern -- the aforementioned photosensitivity -- a conductor -- since the paste is extremely excellent in imprint nature, in almost all cases, such mold release processing is unnecessary However, according to the kind of organic binder currently used for the ceramic green sheet etc., since a low case has the detachability of a base material and a ceramic green sheet, in such a case, well-known surface treatment can be performed suitably.
[0056] moreover -- although the ceramic green sheet was used in the above-mentioned example as a substrate which forms a conductor pattern -- the conductor of this invention -- the pattern formation method -- the conductor to a ceramic green sheet -- what is limited to pattern formation -- it is not -- the conductor to an insulator ceramic layer and dielectric ceramic layer top -- the conductor to a pattern formation and printed circuit board top -- it is applicable to various uses, such as pattern formation moreover, the aforementioned photosensitivity -- a conductor -- pastes may be any of a negative mold and a positive type
[0057] Next, drawing 2 is explained to reference for the ceramic multilayer substrate by the manufacture method of the ceramic multilayer substrate of this invention.
[0058] The ceramic multilayer substrate 1 shown in drawing 2 is a multilayered circuit board which comes to carry out the laminating of the insulating body whorls 12a, 12b, 12c, 12d, 12e, and 12f and the dielectric layers 13a and 13b. Moreover, the capacitor pattern, the coil pattern, the stripline, etc. are formed in the interior of the ceramic multilayer substrate 11 of the inner layer conductor pattern 15 or the Bahia hall 16. Furthermore, on the one side principal plane of the ceramic multilayer substrate 11, the chips 20, such as a chip capacitor, the thick film resistor 21, and the semiconductor IC 22 grade are prepared, and it connects with the surface conductor pattern 17 or the inner layer conductor pattern 15 grade, respectively.
[0059] This ceramic multilayer substrate 11 is producible with the following procedures, for example.
[0060] First, ceramic powder and an organic vehicle are mixed and the slurry for insulator ceramic green sheets is prepared in the end of a glass powder. Moreover, the slurry for dielectric ceramic green sheets is prepared similarly. Subsequently, fabricate each obtained slurry in the shape of a sheet by the doctor blade method etc., it is made to dry at the temperature of 50-150 degrees C, and an insulator ceramic green sheet and a dielectric ceramic green sheet are produced.
[0061] And the conductor pattern used as a capacitor pattern, a coil pattern, etc. is formed on each obtained ceramic green sheet. Moreover, to each green sheet, the Bahia hall is produced if needed. Here, a conductor pattern is formed according to the conductor pattern formation method of this invention shown in drawing 1 .
[0062] Subsequently, after accumulating and sticking by pressure the ceramic green sheet in which the conductor pattern and the Bahia hall were formed, it calcinates at predetermined temperature. Furthermore, similarly, after forming a surface conductor pattern with the application of the conductor pattern formation method of this invention, a chip 20 and a semiconductor IC 22 are carried and a thick film resistor 21 is printed.
[0063] namely, -- according to the manufacture method of the ceramic multilayer substrate of this invention -- photosensitivity -- a conductor -- since gelling of a paste can be suppressed and the application of a up to [the base material] can be performed smoothly, and since it fully suppresses gelling of the paint film after dryness, and it is stabilized and exposure processing and a development can be carried out, a detailed conductor pattern can be formed with high degree of accuracy on the substrate of a ceramic green sheet As a result, the ceramic multilayer substrate corresponding to high-speed-signal-izing and the formation of high-density wiring is fully obtained.
[0064] In addition, the aforementioned ceramic multilayer substrates may be multilayer substrates for RF chip electronic parts, such as a chip inductor and a chip multilayer capacitor, and may be multilayer substrates for RF modules, such as a PLL module and a voltage controlled oscillator, or a multilayer substrate for hybrid ICs.
[0065]
[Example] Hereafter, this invention is explained according to an example.
[0066] kneading by 3 roll mills after mixing the thing of one or less-example composition -- carrying out -- photosensitivity -- a conductor -- it considered as the paste
[0067] Copolymer (weight-average-molecular-weight =50,000):2.0g <conductor-material> copper powder whose copolymerization rate of a <organic binder> methacrylic acid / methyl methacrylate is 25/75 on weight criteria : 9.0g <reactant functional-group content monomer> trimethylolpropane triacrylate : 1.0g <photopolymerization initiator> 2-methyl-1-[4-(Methylthio) phenyl]-2-morpholinopropane-1-ON: -- 0.4g2 and 4-diethyl thioxan ton -- :0.1g <organic-solvent> ethyl carbitol acetate:4.0g <monochrome all compound> dipropylene-glycol monomethyl ether: -- subsequently 4.0g the produced photosensitivity -- a conductor -- the paste was applied by the spin coater on polyester film, after that, it dried at 50 degrees C for

1 hour, and the paint film of 20-micrometer thickness was formed Subsequently, it let the mask with which the pattern of a line / space (last shipment) =20 / 20 (micrometer) was drawn by this paint film pass, and the beam of light of a high pressure mercury vapor lamp was irradiated with the light exposure of 250 mJ/cm2. Then, by sodium-carbonate solution, the development was performed and the conductor pattern of last shipment=20 / 20 (micrometer) was produced on polyester film. And after having piled up polyester film with the ceramic green sheet after leaving this for 200 hours, and performing a heat press for 1 minute under 10MPa and 60-degree C conditions, polyester film was exfoliated and hot printing of the conductor pattern was carried out to up to the ceramic green sheet. Then, after carrying out degreasing processing of this, it calcinated under 900 degrees C and in air, and last shipment=15 / 20 (micrometer), and the conductor pattern with a thickness of 8 micrometers were obtained.

[0068] except for having used 1-heptyl alcohol instead of the example 2 dipropylene-glycol monomethyl ether -- an example 1 -- the same -- carrying out -- photosensitivity -- a conductor -- the paste was produced moreover, the acquired photosensitivity -- a conductor -- the conductor pattern was formed in the ceramic green sheet like the example 1 using the paste

[0069] except for having used 2-octyl alcohol instead of the example 3 dipropylene-glycol monomethyl ether -- an example 1 -- the same -- carrying out -- photosensitivity -- a conductor -- the paste was produced moreover, the acquired photosensitivity -- a conductor -- the conductor pattern was formed in the ceramic green sheet like the example 1 using the paste

[0070] except for having used the butyl lactate instead of the example 4 dipropylene-glycol monomethyl ether -- an example 1 -- the same -- carrying out -- photosensitivity -- a conductor -- the paste was produced moreover, the acquired photosensitivity -- a conductor -- the conductor pattern was formed in the ceramic green sheet like the example 1 using the paste

[0071] except for having used the 3-methoxy-3-methyl-butanol instead of the example of comparison 1 dipropylene-glycol monomethyl ether -- an example 1 -- the same -- carrying out -- photosensitivity -- a conductor -- the paste was produced moreover, the acquired photosensitivity -- a conductor -- a paste -- using -- an example 1 -- the same -- carrying out -- the conductor to a ceramic green sheet -- pattern formation was tried

[0072] except for having used 4-methyl cyclohexanol instead of the example of comparison 2 dipropylene-glycol monomethyl ether -- an example 1 -- the same -- carrying out -- photosensitivity -- a conductor -- the paste was produced moreover, the acquired photosensitivity -- a conductor -- a paste -- using -- an example 1 -- the same -- carrying out -- the conductor to a ceramic green sheet -- pattern formation was tried

[0073] The rate of an imprint to the ceramic green sheet was measured about the conductor pattern by the examples 1-4 and the examples 1-2 of comparison which were mentioned above. The measurement result is shown in the following table 1. Moreover, in Table 1, the boiling point of each monochrome all compound was indicated collectively. In addition, the rate of an imprint shows the rate of the conductor pattern area on the ceramic green sheet after the imprint to the conductor pattern area on the polyester film before an imprint. That is, what has a small rate of an imprint means that a conductor pattern remains on polyester film.

[0074]

[Table 1]

	モノオール化合物	沸点	転写率
実施例 1	ジプロピレングリコールモノメチルエーテル	189-190℃	100%
実施例 2	1-ヘプチルアルコール	176℃	70%
実施例 3	2-オクチルアルコール	178-179℃	97%
実施例 4	乳酸ブチル	185-187℃	100%
比較例 1	3-メトキシ-3-メチル-ブタノール	173-175℃	25%
比較例 2	4-メチルシクロヘキサノール	172-175℃	30%

[0075] the photosensitivity which contains a monochrome all compound with a boiling point of 178 degrees C or more like examples 1-4 from Table 1 -- a conductor -- when a paste is used, it turns out that the rate of an imprint of a conductor pattern was very high This means that the highly precise and detailed conductor pattern has been formed on the ceramic green sheet with the replica method mentioned above. On the other hand, like the examples 1-2 of comparison, when a monochrome all compound with a boiling point of less than 178 degrees C was used, the rate of an imprint to a ceramic green sheet was very low. This is considered to be because for the paint film or the conductor pattern to have gelled on polyester film.

[0076] moreover, the photosensitivity of an example 1 -- a conductor -- predetermined period storage of the paste was carried out under 20 degrees C and in air, and the preservation stability was evaluated consequently, the photosensitivity of an example 1 -- a conductor -- an application do not gel a paste at each [immediately after production and of after (one day, three days, one week, and one month)] time, but according to the spin coater to a polyester film top to which time, and the conductor by the photolithography method -- pattern formation was able to be performed good

[0077] kneading by 3 roll mills after mixing the thing of five or less-example composition -- carrying out -- photosensitivity -- a conductor -- it considered as the paste

[0078] Copolymer (weight-average-molecular-weight =50,000):2.0g <anion adsorptivity particle> hydroxyapatite whose copolymerization rate of a <organic binder> methacrylic acid / methyl methacrylate is 25/75 on weight criteria (5 micrometers of mean particle diameters) : 0.1g <conductor-material> copper powder : 4-diethyl Thioxan Ton: 9.0g <reactant functional-group content monomer> trimethylolpropane triacrylate: -- a 1.0g <photopolymerization initiator> 2-methyl -1-[4-(methylthio) phenyl]-2-morpholinopropane-1-ON: -- 0.4g2 -- 0.1g <organic-solvent> ethyl carbitol acetate: -- 4.0g propylene-glycol-monomethyl-ether acetate: -- subsequently 1.0g the produced photosensitivity -- a conductor -- the paste was applied by the spin coater on polyester film, after that, it dried at 50 degrees C for 1 hour, and the paint film of 20-micrometer

thickness was formed And it let the mask with which the pattern of a line / space (last shipment) =20 / 20 (micrometer) was drawn by this paint film pass, and the beam of light of a high pressure mercury vapor lamp was irradiated with the light exposure of 250 mJ/cm2. Then, negatives were developed by sodium-carbonate solution and the conductor pattern of last shipment=20 / 20 (micrometer) was produced on polyester film. Subsequently, after having piled up polyester film with the ceramic green sheet after leaving this for 200 hours, and performing a heat press for 1 minute under 10MPa and 60-degree C conditions, polyester film was exfoliated and hot printing of the conductor pattern was carried out to up to the ceramic green sheet. It calcinated under 900 degrees C and in air after degreasing this, and last shipment=15 / 20 (micrometer), and the conductor pattern with a thickness of 8 micrometers were obtained.

[0079] instead of [of example 6 hydroxyapatite] -- a CHIKUSO agent (De Dis Perlon 305, : hydrogenation castor oil system by the Kusumoto Chemicals company) -- except for having added 0.1g -- an example 5 -- the same -- carrying out -- photosensitivity -- a conductor -- the paste was produced moreover, the acquired photosensitivity -- a conductor -- the conductor pattern was formed on the ceramic green sheet like the example 5 using the paste

[0080] except for not adding example of comparison 3 hydroxyapatite -- an example 5 -- the same -- carrying out -- photosensitivity -- a conductor -- the paste was produced moreover, the acquired photosensitivity -- a conductor -- a paste -- using -- an example 5 -- the same -- carrying out -- the conductor to a ceramic green sheet -- pattern formation was tried

[0081] except for having used 0.1g of phosphoric acids instead of example of comparison 4 hydroxyapatite -- an example 5 -- the same -- carrying out -- photosensitivity -- a conductor -- the paste was produced moreover, the acquired photosensitivity -- a conductor -- a paste -- using -- an example 5 -- the same -- carrying out -- the conductor to a ceramic green sheet -- pattern formation was tried

[0082] except for having used benzotriazol 0.02g instead of example of comparison 5 hydroxyapatite -- an example 5 -- the same -- carrying out -- photosensitivity -- a conductor -- the paste was produced moreover, the acquired photosensitivity -- a conductor -- a paste -- using -- an example 5 -- the same -- carrying out -- the conductor to a ceramic green sheet -- pattern formation was tried

[0083] The rate of an imprint to the ceramic green sheet was measured about the conductor pattern by the examples 5-6 and the examples 3-5 of comparison which were mentioned above. The measurement result is shown in the following table 2.

[0084]

[Table 2]

	添加物	転写率
実施例 5	ﾊｲﾄﾞﾛｷｼｱﾊﾟﾀｲﾄ	100%
実施例 6	ﾃﾞｨｽﾊﾟﾛﾝ305	100%
比較例 3	なし	------
比較例 4	リン酸	70%
比較例 5	ﾍﾞﾝｿﾞﾄﾘｱｿﾞｰﾙ	72%

[0085] the photosensitivity which contains hydroxyapatite as anion adsorptivity matter like an example 5 from Table 2 -- a conductor -- when a paste is used, it turns out that the rate of an imprint of the conductor pattern to a ceramic green sheet was very high moreover, the photosensitivity using the CHIKUSO agent like an example 6 -- a conductor -- when a paste was used, the rate of an imprint of the conductor pattern to a ceramic green sheet was very high This means that the highly precise and detailed conductor pattern has been formed on the ceramic green sheet with the replica method mentioned above. On the other hand, the conductor pattern by the examples 3-5 of comparison had the very low rate of an imprint to a ceramic green sheet. This is considered to be because for the paint film to have gelled on polyester film.

[0086] moreover, the photosensitivity by the example 5 and the example 6 -- a conductor -- archiving of the paste was carried out under 20 degrees C and in air, and the preservation stability was evaluated consequently, the photosensitivity by the example 5 and the example 6 -- a conductor -- an application do not gel a paste at each [immediately after production and of after (one day, three days, one week, and one month)] time, but according to the spin coater to a polyester film top to which time, and the conductor by the photolithography method -- pattern formation was able to be performed good moreover, the photosensitivity according to the example 3 of comparison similarly -- a conductor -- although the preservation stability of a paste was evaluated -- this photosensitivity -- a conductor -- 24 hours after the paste was gelled and was not able to form the conductor pattern to a polyester film top

[0087] as mentioned above, the so-called replica method -- setting -- photosensitivity -- a conductor -- the detailed and highly precise conductor pattern has been formed very good on the ceramic green sheet by taking measures against gelling which were mentioned above to the paste

[0088]

[Effect of the Invention] according to the formation method of the conductor pattern of this invention -- photosensitivity -- a conductor -- since the anion adsorptivity matter or CHIKUSO agents, such as a monochrome all compound with a boiling point of 178 degrees C or more and hydroxyapatite, are contained during a paste -- photosensitivity -- a conductor -- gelling of a paste and gelling of the paint film after dryness can fully be suppressed, and a detailed conductor pattern can be formed with high precision

[0089] moreover -- according to the manufacture method of the ceramic multilayer substrate of this invention -- photosensitivity -- a conductor, since the anion adsorptivity matter or CHIKUSO agents, such as a monochrome all compound with a boiling point of 178 degrees C or more and hydroxyapatite, are contained during a paste photosensitivity -- a conductor -- gelling of a paste and gelling of the paint film after dryness can fully be suppressed, and a detailed conductor pattern can be formed with high precision

on a ceramic green sheet, as a result the ceramic multilayer substrate corresponding to high-speed-signal-izing and the formation of high-density wiring is fully obtained

---

[Translation done.]

CLAIMS

[Claim(s)]

[Claim 1] the photosensitivity which consists of the organic binder and the photosensitive organic component which has an acid functional group, polyvalent-metal powder, and a monochrome all compound with a boiling point of 178 degrees C or more -- a conductor -- the process which applies a paste on a base material, and the aforementioned photosensitivity -- a conductor -- the formation method of a conductor pattern characterized by to have the process which exposes and develops a paste and forms a predetermined conductor pattern, and the process which imprint on a substrate the aforementioned conductor pattern formed on the aforementioned base material

[Claim 2] The formation method of a conductor pattern characterized by providing the following. the photosensitivity which consists of the organic binder and the photosensitive organic component which have an acid functional group, polyvalent metal powder, and anion adsorptivity matter which has the property to adsorb the anion of the aforementioned organic binder -- a conductor -- the process which applies a paste on a base material the aforementioned photosensitivity -- a conductor -- the process which exposes and develops a paste and forms a predetermined conductor pattern, and the process which imprints on a substrate the aforementioned conductor pattern formed on the aforementioned base material

[Claim 3] the photosensitivity which consists of the organic binder and the photosensitive organic component which has an acid functional group, polyvalent-metal powder, and a CHIKUSO agent -- a conductor -- the process which applies a paste on a base material, and the aforementioned photosensitivity -- a conductor -- the formation method of a conductor pattern characterized by to have the process which exposes and develops a paste and forms a predetermined conductor pattern, and the process which imprint on a substrate the aforementioned conductor pattern formed on the aforementioned base material

[Claim 4] The aforementioned polyvalent metal powder is the formation method of a conductor pattern according to claim 1 to 3 characterized by being at least one sort of metal powders or the end of an alloy powder it is chosen out of the group which consists of copper, aluminum, palladium, nickel, and iron.

[Claim 5] The manufacture method of the ceramic multilayer substrate characterized by providing the following. the photosensitivity which consists of the organic binder and the photosensitive organic component which have an acid functional group, polyvalent metal powder, and a monochrome all compound with a boiling point of 178 degrees C or more -- a conductor -- the process which applies a paste on a base material the aforementioned photosensitivity -- a conductor -- the process which exposes and develops a paste and forms a predetermined conductor pattern The process which imprints the aforementioned conductor pattern formed on the aforementioned base material on a ceramic green sheet. They are a laminating and the process to calcinate about the ceramic green sheet in which the aforementioned conductor pattern was prepared.

[Claim 6] The manufacture method of the ceramic multilayer substrate characterized by providing the following. the photosensitivity which consists of the organic binder and the photosensitive organic component which have an acid functional group, polyvalent metal powder, and anion adsorptivity matter which has the property to adsorb the anion of the aforementioned organic binder -- a conductor -- the process which applies a paste on a base material the aforementioned photosensitivity -- a conductor -- the process which exposes and develops a paste and forms a predetermined conductor pattern The process which imprints the aforementioned conductor pattern formed on the aforementioned base material on a ceramic green sheet. They are a laminating and the process to calcinate about the ceramic green sheet in which the aforementioned conductor pattern was prepared.

[Claim 7] The manufacture method of the ceramic multilayer substrate characterized by providing the following. the photosensitivity which consists of the organic binder and the photosensitive organic component which have an acid functional group, polyvalent metal powder, and a CHIKUSO agent -- a conductor -- the process which applies a paste on a base material the aforementioned photosensitivity -- a conductor -- the process which exposes and develops a paste and forms a predetermined conductor pattern The process which imprints the aforementioned conductor pattern formed on the aforementioned base material on a ceramic green sheet. They are a laminating and the process to calcinate about the ceramic green sheet in which the aforementioned conductor pattern was prepared.

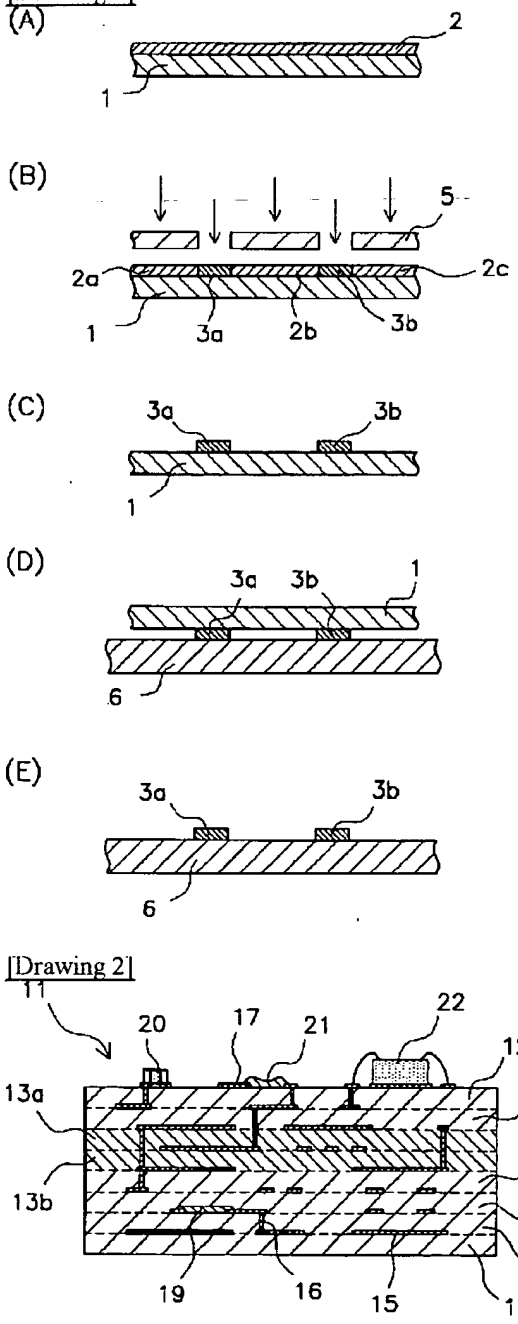
[Claim 8] The aforementioned polyvalent metal powder is the manufacture method of the ceramic multilayer substrate according to claim 5 to 7 characterized by being at least one sort of metal powders or the end of an alloy powder it is chosen out of the group which consists of copper, aluminum, palladium, nickel, and iron.

[Translation done.]

* NOTICES *

DRAWINGS

[Drawing 1]



[Drawing 2]

[Translation done.]